2011 ATC Bound Constraint Report Overview

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ATC Economic Planning
January 30, 2012

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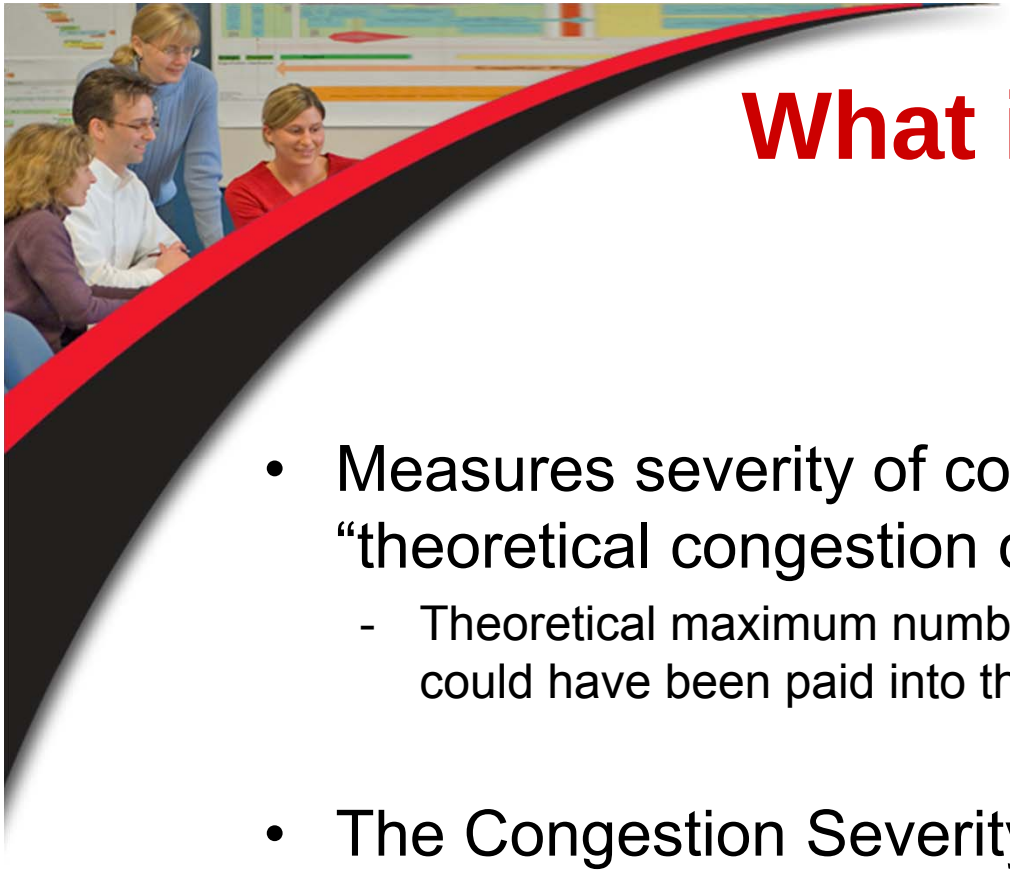

What is the Congestion Severity Index?

- Measures severity of constraints through the "theoretical congestion cost"
  - Theoretical maximum number of dollars (in millions) that could have been paid into the market due to the constraint
- The Congestion Severity Index takes into account:
  - The amount of time a constraint is "bound"
  - The financial impacts of the constraint during those times

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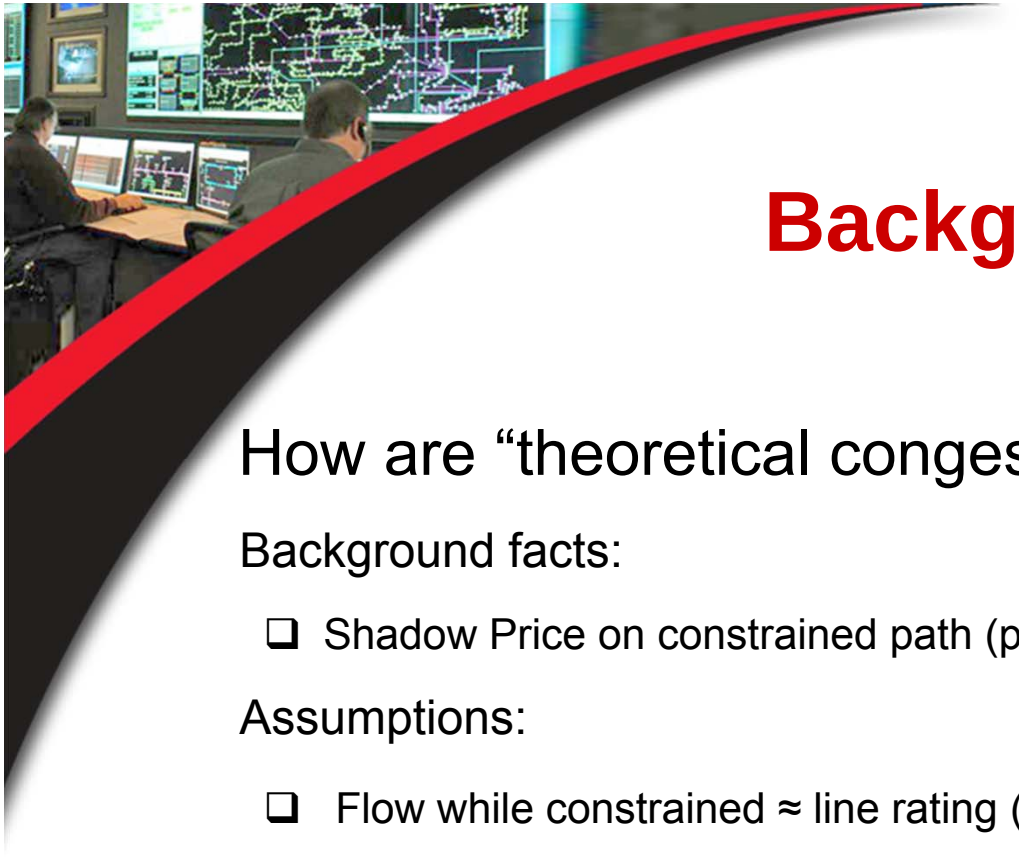

Background Assumptions

How are “theoretical congestion costs” calculated?

Background facts:

- Shadow Price on constrained path (public data)

Assumptions:

- Flow while constrained ≈ line rating (from ATC ratings database)

$\Sigma_{\text{All Hours}}$ [Rating * Shadow Price] = Theoretical Congestion Costs

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Congestion Severity Index (CSI)

Theoretical Congestion Costs → CSI

$$\frac{\sum_{\text{All Hours}} [\text{Rating} * \text{Shadow Price}]}{1{,}000{,}000} = \text{Congestion Severity Index}$$

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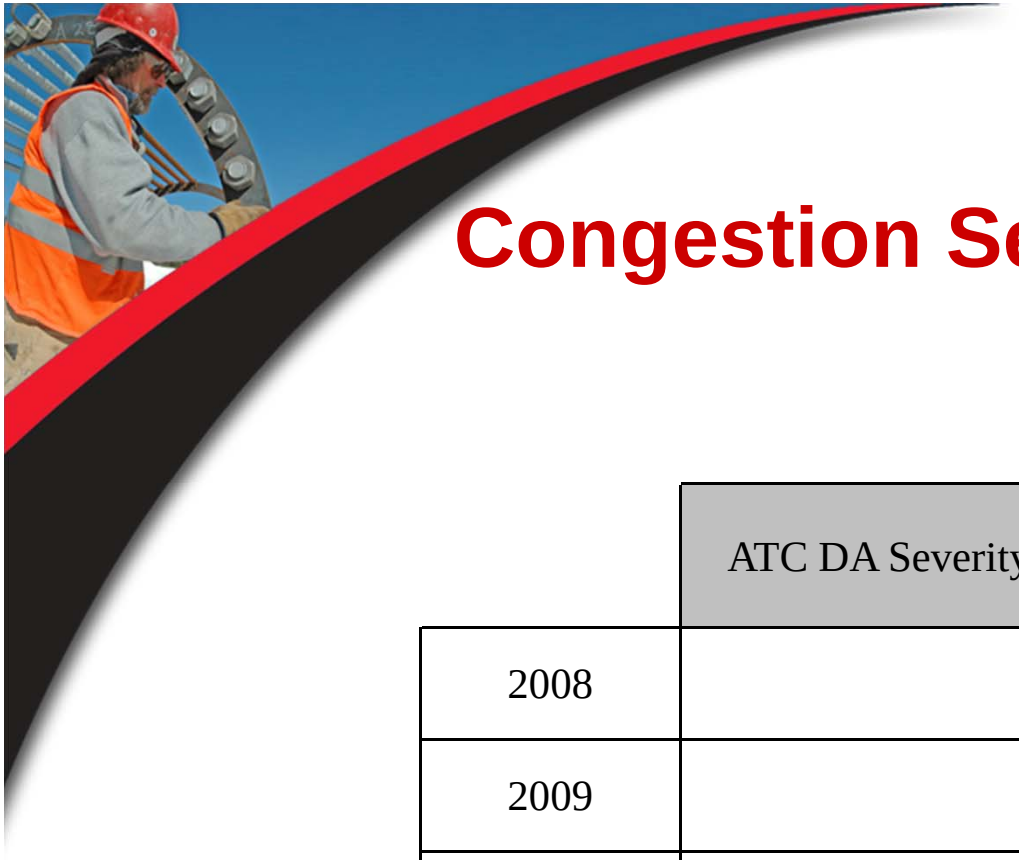

Congestion Severity Index History

	ATC DA Severity Index	ATC RT Severity Index
2008	179.31	179.89
2009	116.39	110.23
2010	109.19	111.68
2011	91.27	78.19

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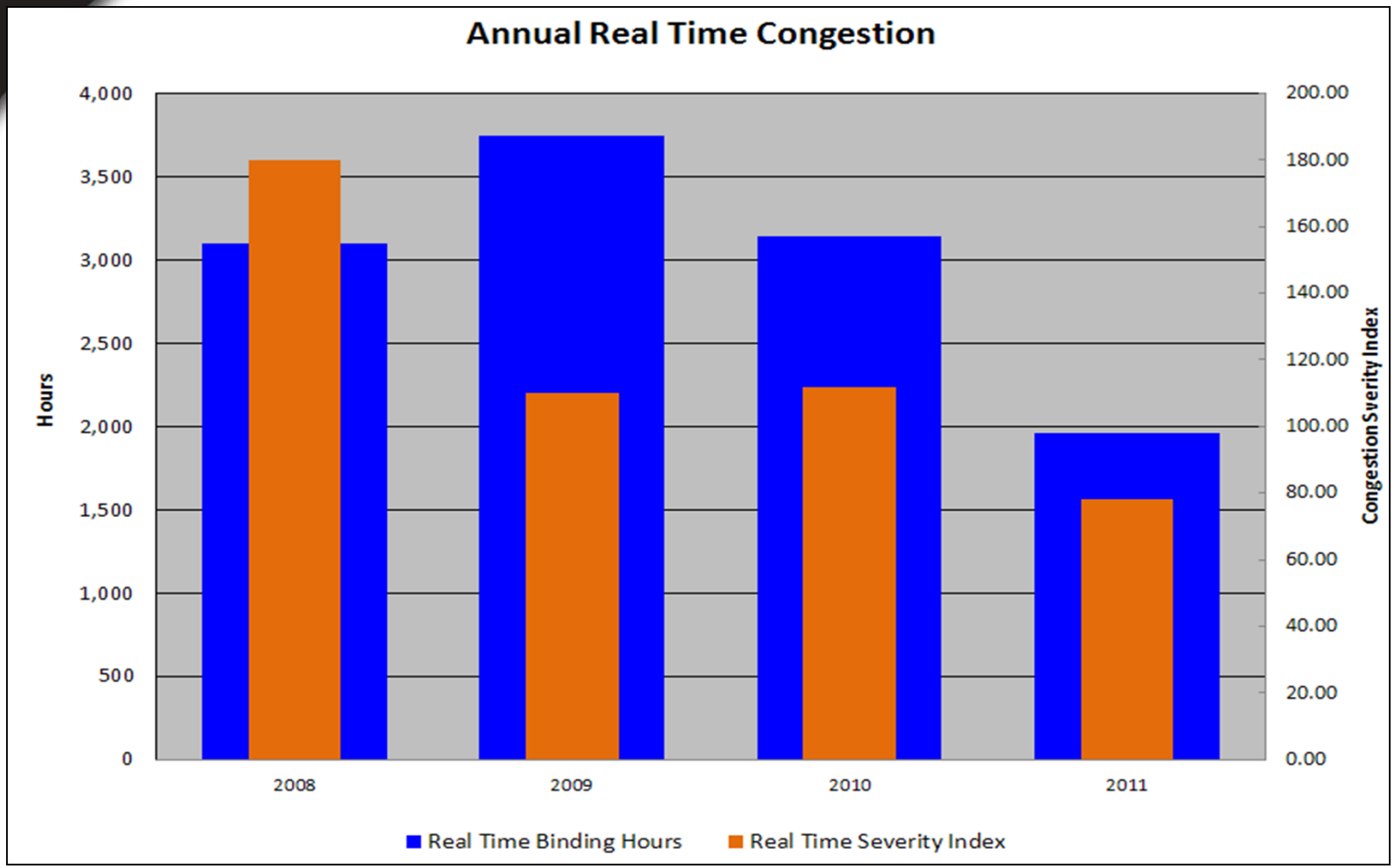
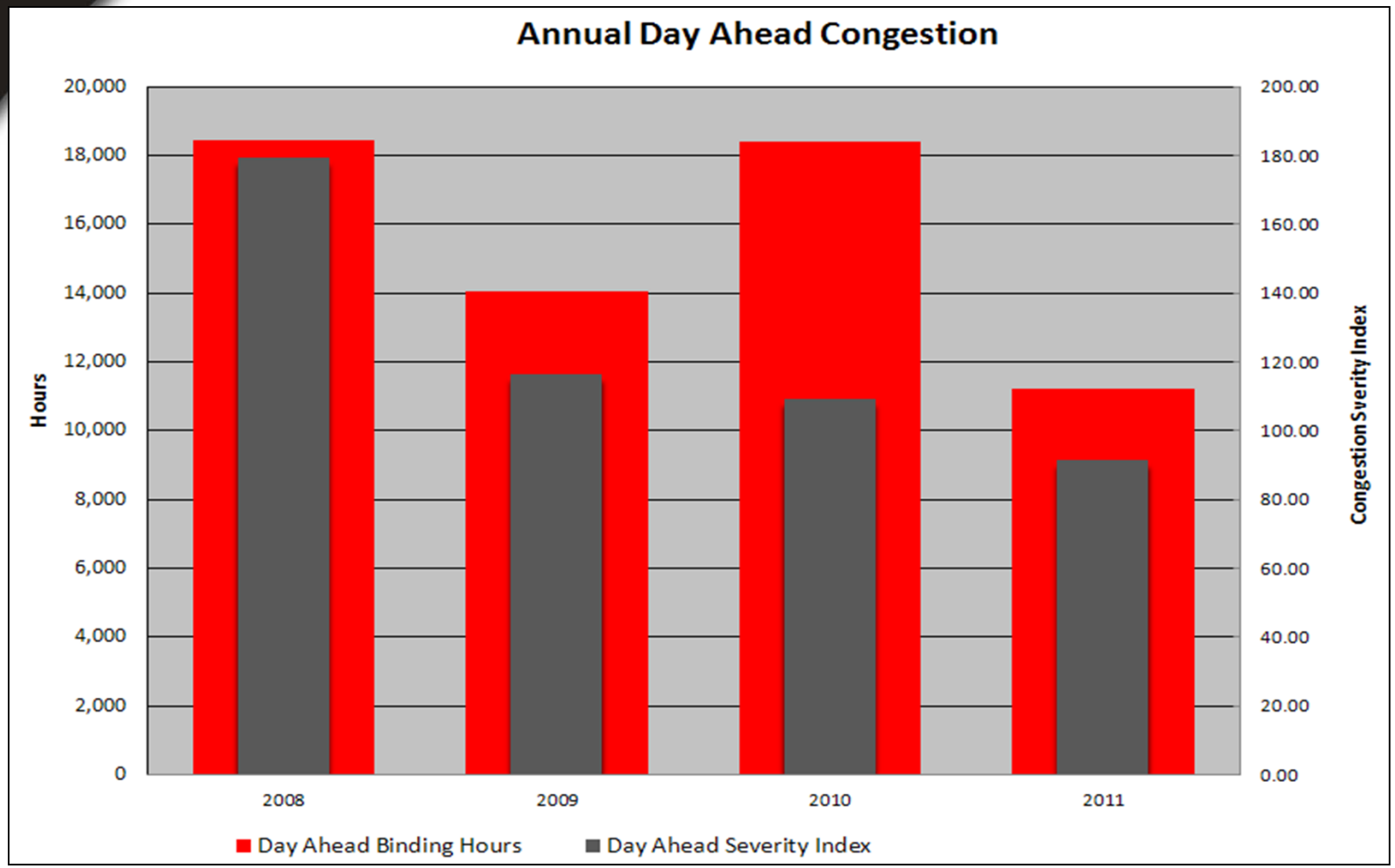
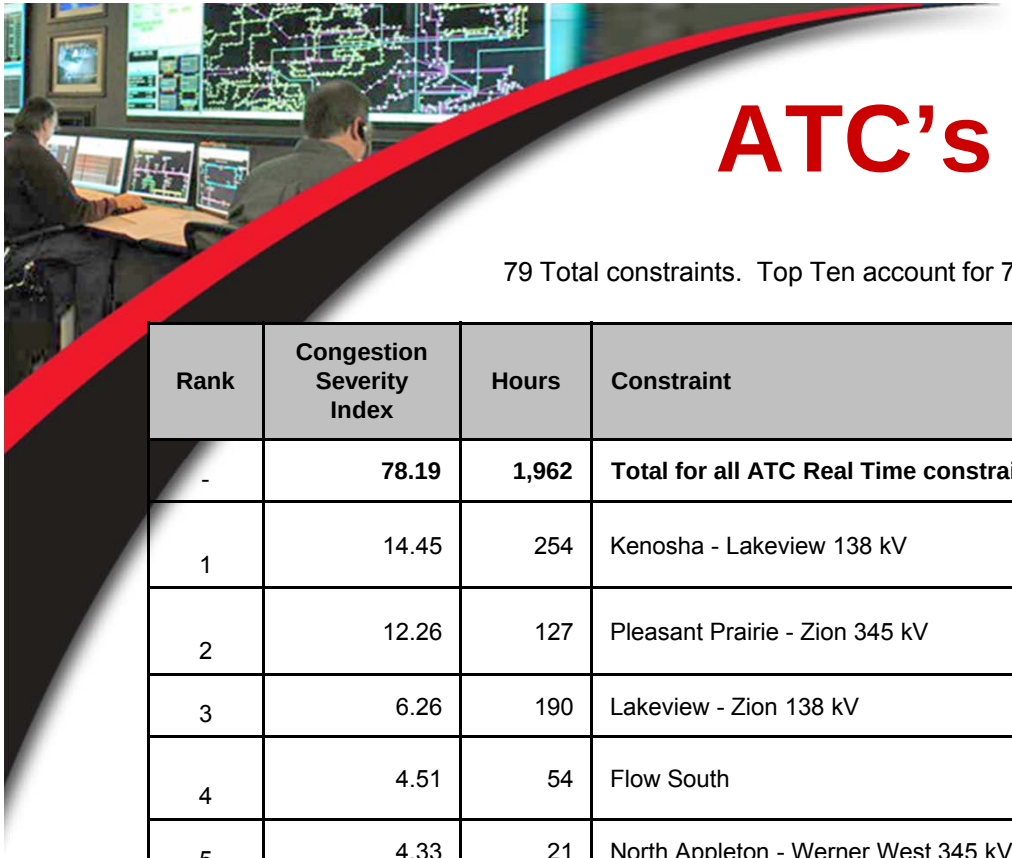
Severity vs. Hours
ATC - Real Time Market



Severity vs. Hours
ATC - Day Ahead Market





ATC's Top Ten List (RT)

79 Total constraints. Top Ten account for 75% of total severity but just 65% of total hours.

Rank	Congestion Severity Index	Hours	Constraint	Potential Solution
-	**78.19**	**1,962**	**Total for all ATC Real Time constraints in 2011**	**Solutions listed in ATC TYA unless otherwise noted**
1	14.45	254	Kenosha - Lakeview 138 kV	Pleasant Prairie - Zion Energy Center 345 kV line (Proposed 2014)
2	12.26	127	Pleasant Prairie - Zion 345 kV	Pleasant Prairie - Zion Energy Center 345 kV line (Proposed 2014)
3	6.26	190	Lakeview - Zion 138 kV	Pleasant Prairie - Zion Energy Center 345 kV line (Proposed 2014)
4	4.51	54	Flow South	Flow Control Device (Proposed, 2014) ATC Northern Plan Projects
5	4.33	21	North Appleton - Werner West 345 kV	ATC Northern Plan Projects
6	4.03	5	Minnesota to Wisconsin Exports Interface (MWEX)	Monroe County - Council Creek 161 kV line (Proposed, 2014) Badger Coulee 345 kV line (Proposed 2018)
7	3.76	58	Rockdale 345/138 kV Transformer T21	Rockdale - West Middleton 345 kV (Planned 2013)
8	3.56	32	Indian Lake 138/69 kV Transformer T2	Indian Lake - Hiawatha 138kV line (Proposed, 2014) Flow Control Device (Proposed, 2014) ATC Northern Plan Projects
9	3.07	524	Nordic - Felch Tap 69 kV	Arnold 345/138 kV Transformer (Provisional, 2015) Second Chandler 138/69 kV Transformer (Proposed, 2012) Flow Control Device (Proposed, 2014) ATC Northern Plan Projects
10	2.81	17	Nelson Dewey 161/138 kV Transformer T91	Badger Coulee 345 kV line (Proposed 2018)

http://oasis.midwestiso.org/documents/ATC/market_constraints.html

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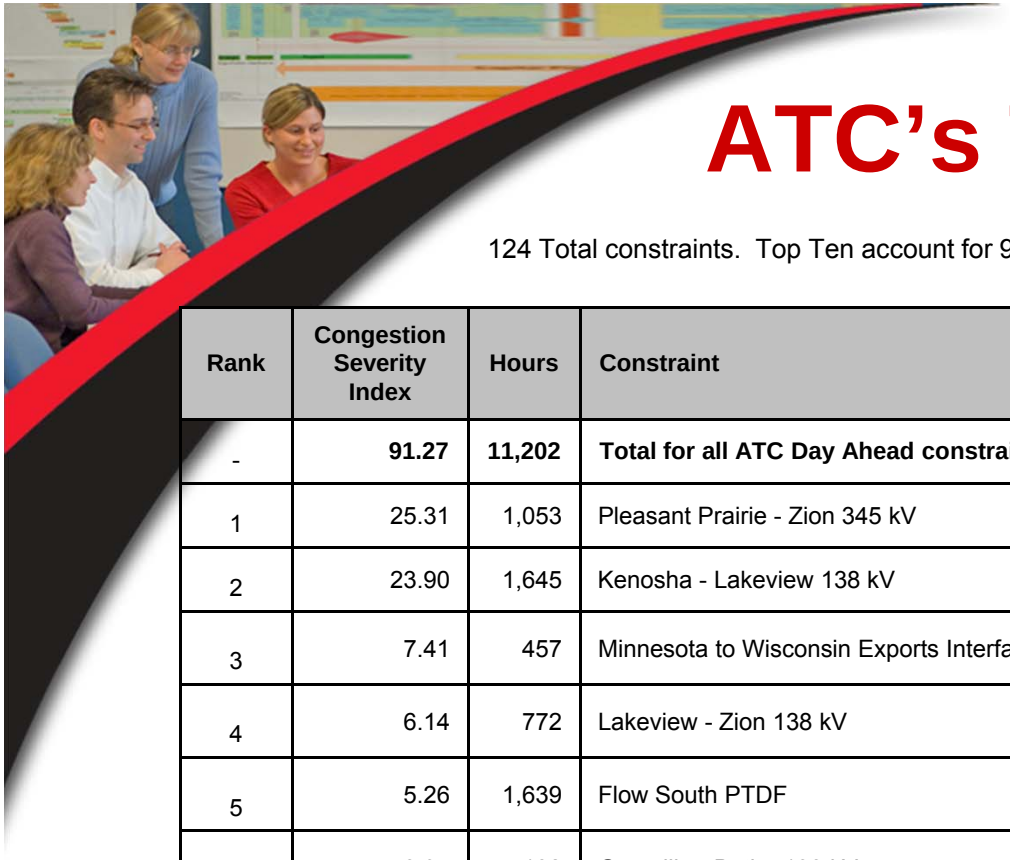

ATC's Top Ten List (DA)

124 Total constraints. Top Ten account for 90% of total severity but just 80% of total hours.

Rank	Congestion Severity Index	Hours	Constraint	Potential Solution
-	**91.27**	**11,202**	**Total for all ATC Day Ahead constraints in 2011**	**Solutions listed in ATC TYA unless otherwise noted**
1	25.31	1,053	Pleasant Prairie - Zion 345 kV	Pleasant Prairie - Zion Energy Center 345 kV line (Proposed 2014)
2	23.90	1,645	Kenosha - Lakeview 138 kV	Pleasant Prairie - Zion Energy Center 345 kV line (Proposed 2014)
3	7.41	457	Minnesota to Wisconsin Exports Interface (MWEX)	Monroe County - Council Creek 161 kV line (Proposed, 2014) Badger Coulee 345 kV line (Proposed 2018)
4	6.14	772	Lakeview - Zion 138 kV	Pleasant Prairie - Zion Energy Center 345 kV line (Proposed 2014)
5	5.26	1,639	Flow South PTDF	Flow Control Device (Proposed, 2014) ATC Northern Plan Projects
6	3.94	182	Granville - Butler 138 kV	Terminal Equipment Replacement at Butler Substation (Proposed 2012)
7	3.89	2,372	Nordic - Felch Tap 69 kV	Arnold 345/138 kV Transformer (Provisional, 2015) Second Chandler 138/69 kV Transformer (Proposed, 2012) Flow Control Device (Proposed, 2014) ATC Northern Plan Projects
8	3.29	220	Rockdale 345/138 kV Transformer T21	Rockdale - West Middleton 345 kV (Planned 2013)
9	1.74	286	Indian Lake 138/69 kV Transformer T2	Indian Lake - Hiawatha 138kV line (Proposed, 2014) Flow Control Device (Proposed, 2014) ATC Northern Plan Projects
10	1.47	331	Sheepskin - Stoughton 69 kV	Rockdale - West Middleton 345 kV (Planned 2013)

http://oasis.midwestiso.org/documents/ATC/market_constraints.html

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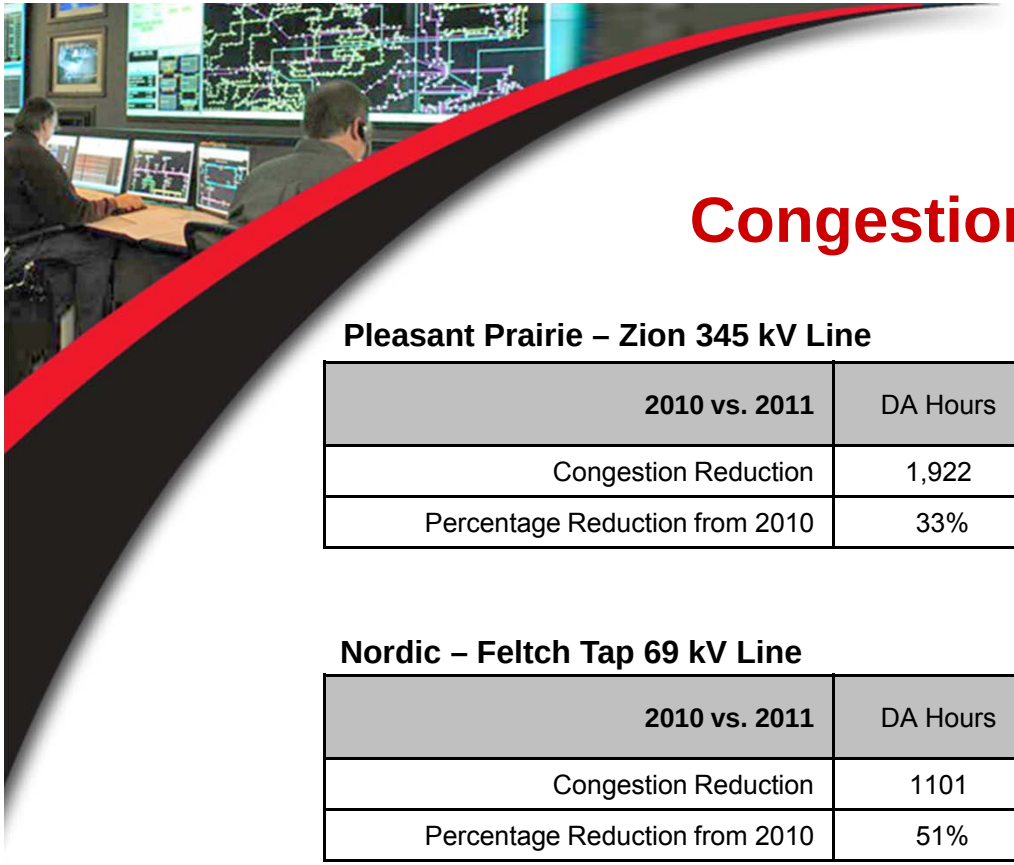

A Closer Look:

Congestion Reduction - 2010 to 2011

Pleasant Prairie – Zion 345 kV Line

2010 vs. 2011	DA Hours	DA Severity Index	RT Hours	RT Severity Index
Congestion Reduction	1,922	12.27	402	24.73
Percentage Reduction from 2010	33%	65%	76%	67%

Nordic – Feltch Tap 69 kV Line

2010 vs. 2011	DA Hours	DA Severity Index	RT Hours	RT Severity Index
Congestion Reduction	1101	4.04	511	7.35
Percentage Reduction from 2010	51%	32%	49%	71%

Minnesota to Wisconsin Export Interface (MWEX)

2010 vs. 2011	DA Hours	DA Severity Index	RT Hours	RT Severity Index
Congestion Reduction	55	5.15	2	2.25
Percentage Reduction from 2010	41%	11%	33%	36%

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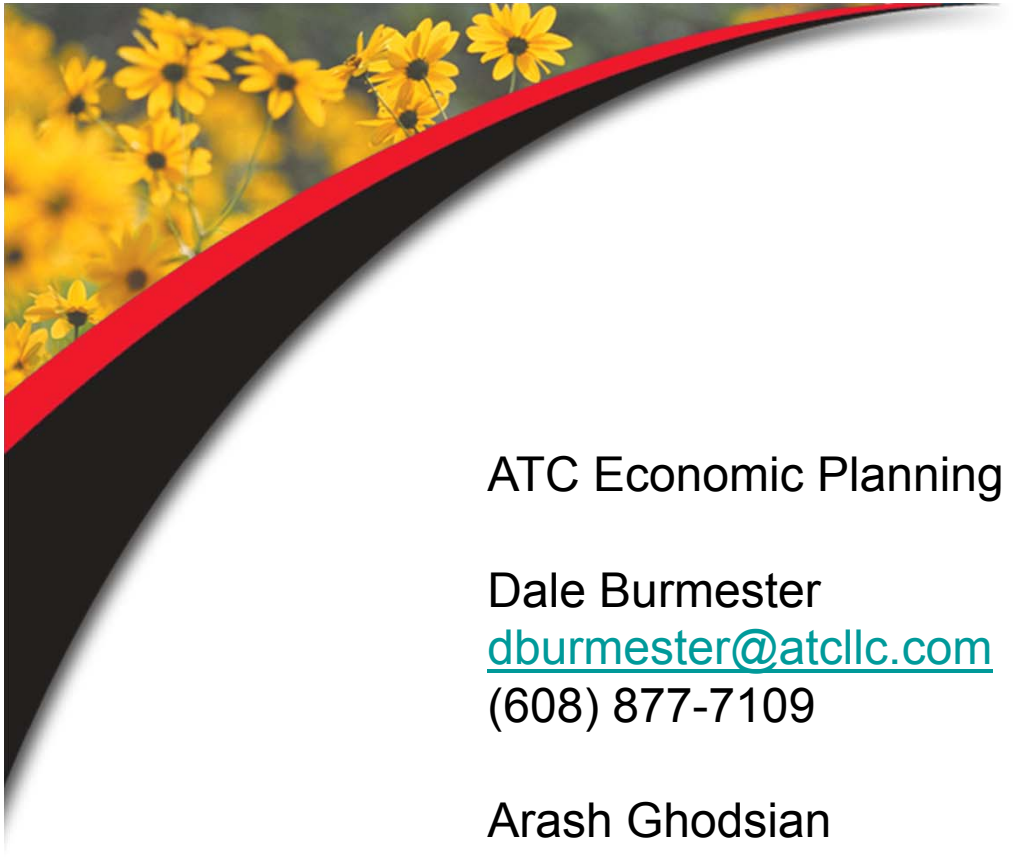

Questions?

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